

# PATENT SPECIFICATION

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(54) A METHOD OF CONTINUOUSLY MEASURING A  
NUMBER OF UNDERWATER PARAMETERS AND  
SIMULTANEOUSLY TRANSMITTING THE MEASURED  
PARAMETERS TO A SHIP

(71) We, MORSKI INSTYTUT RYBACKI,  
of 1 Al Zjednoczenia, Gdynia, Poland, an  
institute organised and existing under the  
laws of Poland, do hereby declare the invention,  
for which we pray that a patent may  
be granted to us, and the method by which  
it is to be performed, to be particularly de-  
scribed in and by the following statement:

This invention relates to a method of con-  
tinuously measuring a number of under-  
water parameters and simultaneously trans-  
mitting the measured parameters on board  
ship.

Fishing sets are not only run under water,  
usually at remarkable depths, but they also  
follow far behind the ship. During the  
trawling action, individual components of  
the fishing gear undergo considerable spatial  
changes, and in addition, they alter their  
usual mutual alignment, i.e. they change  
their angular position relative to each other.  
These changes in mutual setting of compo-  
nents basically influence the operation of  
other component units as well as the opera-  
tion of the whole fishing gear and its coac-  
tion with the trawling ship both directly and  
indirectly, whereby the functional relation-  
ships are very complicated.

There are known methods used to take  
measurements of separate, preselected para-  
meters. Among such parameters are;  
forces occurring in underwater components,  
these forces being measured by underwater  
dynamometers; vertical and horizontal  
openings, measured with relevant vertical  
opening gauges and horizontal opening  
gauges; angles formed through different set-  
ting of components, measured by means of  
underwater anglegraphs; and, the speed of  
each component in motion, measured by the  
use of underwater logs fitted with suitable  
recorders. Other essential parameters to be  
determined are the depths of the various  
parts of the gear measured by depth gauges.  
In addition to the parameters of the under-

water components specified above, the ship  
operation parameters, and other relevant  
data are measured.

Till now, there have not been known,  
however, methods for continuous and 50  
simultaneous measurement of a number of  
different parameters, and still less, of all  
specified parameters at one time, with their  
simultaneous transmitting on board ship.

An object of this invention is to provide 55  
a continuous underwater measurement of a  
number of different parameters with  
immediate and continuous transmission of  
the data to a ship so as to ensure availability  
of physical quantities for the determination 60  
of fishing gear parameters. It is the varia-  
tions of the trawling set and the perform-  
ance of the ship under various trawling con-  
ditions that is to be investigated. As a re-  
sult of such measurements, one can readily 65  
introduce amendments in the reinforcement  
and construction of trawling fishing sets.  
Other objects are to determine properties of  
both in-use as well as proposed trawling  
sets, to ensure optimum selection of area of 70  
operation for the fishing vessel; optimum  
selection of trawling set combination, to  
allow systematic improvements in the  
general designing methods of such fishing  
sets, and observation of the fishing process 75  
from the viewpoint of its automatization  
potentialities. Still another object of the  
present invention is to establish suitable  
tactics for trawl sea-fishing programmes.

Objects, as set forth above, have been 80  
met by devising a new process of measure-  
ment in which a multiple-gauge measuring  
system has been combined with computer  
facilities.

According to the present invention there 85  
is provided a method of continuously  
measuring a number of different underwater  
parameters and simultaneously transmitting  
signals representing the said measured  
parameters to a ship, comprising installing 90

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a plurality of transducers, each adapted to measure the required different parameter, on relevant points of a trawling apparatus, obtaining from the respective transducers, 5 signals representing the said parameters, feeding the signals from the transducers to an underwater telemetering station located on the trawling apparatus wherein the signals are multiplexed to form a composite 10 signal, and transmitting the composite signal to a computer on board ship by cable, and supplying power for the transducers and the telemetering station from the ship by cables.

15 The outputs of the underwater transducers are intensified by amplifiers located in the underwater transducers so that all the signals have a predetermined amplitude sufficient to overcome the effect of noise and interference.

20 Another feature of the invention is that internal circuits of the separate transducers are electrically insulated from transmission lines in order that transducer outputs are 25 independent of the fluctuations in line insulation normally found in sea water environment.

25 It is also important that all underwater sub-units, i.e. the transducers and the telemetering station are protected against over-voltage and short-circuit effects, likely to take place in the transmission lines, by known overload electronic circuitry provided on inputs and outputs and operative 35 in the case of emergency or disturbance.

30 The outputs from the underwater telemetering station are fed to the on board computer by cable using a pulse-code modulation system.

35 The outputs from the transducers are fed to the telemetering station inputs where they are sampled in a preselected sequence controllable, for example from the computer desk, or according to a preset programme.

40 The signals are then coded, multiplexed and transmitted to a computer installed on board ship.

45 The speed of measuring information delivered from the transducers is adapted to 50 suit computer speed.

55 Among the technical and operational consequences of this invention, is, the achievement of the above mentioned direct and indirect objects hitherto not possible with known methods. The method according to this invention provides simultaneously information on a great number of different 60 parameters. This information may be immediately processed thus providing a wide information basis for the process under observation. The method provides, also, very precise information on the measured dynamic states of the fishing set, this information being especially useful in 65 the design of systems for the automatiza-

tion of fishing operations, including capacity of the trawling set, trawling with guidance of net to enclose fish shoals, etc. Also, the method according to this invention allows immediate action to be taken to influence 70 the course of the fishing process. The method offers also the possibility of using all measurements in a comparable way when it is introduced on industrial vessels, in particular, vessels with less-developed 75 measuring systems than found on specialised fishing vessels. In this way, the range of research being carried out is considerably widened. The method according to this invention results in the raising of the 80 standards of design and construction of fishing vessels and trawling units.

WHAT WE CLAIM IS:—

1. A method of continuously measuring a number of different underwater parameters and simultaneously transmitting signals representing the said measured parameters to a ship, comprising installing a plurality of transducers, each adapted to measure the required different parameter, 85 on relevant points of a trawling apparatus, obtaining from the respective transducers, signals representing the said parameters, feeding the signals from the transducers to an underwater telemetering station located 90 on the trawling apparatus wherein the signals are multiplexed to form a composite signal, and transmitting the composite signal to a computer on board ship by cable, the power supply for the transducers and 95 the telemetering station being supplied by cables from the ship.

2. The method as claimed in Claim 1, wherein the signals from the transducers are pulse code modulated in the underwater 100 telemetering station and the pulse code modulated signal is transmitted to the computer on board ship by cable.

3. The method as claimed in any preceding Claim, wherein the outputs of the underwater transducers are amplified by amplifiers located in the underwater transducers so that all the signals have a predetermined 105 amplitude sufficient to overcome the effect of noise and interference.

4. The method as claimed in any preceding Claim, wherein the internal circuitry of each individual transducer is electrically insulated from transmission lines so that the outputs are independent of fluctuations in 110 line insulation.

5. The method claimed in any preceding Claim, wherein the underwater units are protected against overvoltage and short-circuit effects in transmission lines by electronic overload circuitry responsive to surge currents, short circuits and similar faults.

6. The method claimed in any preceding Claim, in which the speed of information, based on data measured, supplied from the 115

underwater transducers by way of the submarine telemetering station to the computer input on board ship is readjusted to meet operational speed requirements of the computer in use.

7. A method of continuously measuring a number of different underwater parameters and simultaneously transmitting the measured parameters to a ship substantially 10 has hereinabove described.

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